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THE STAGES OF ANAESTHESIA* A NEW CONCEPT

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All anaesthetics vary in their effects and reactions in different individuals and no standard dosage is possible by any criteria of body weight, age, height or sex, which will, without fail, produce identical results in every case. Not only may patients react differently, but different amounts of the same anaesthetic are often required for the production of identical degrees of anaesthesia in different patients. The signs and symptoms produced by each anaesthetic are, however, fairly constant and techniques of administration and classifications are based on them.

Guedel's classification was formulated for ether, but it has become customary to refer to the stages of anaesthesia with any agent in terms of this classification. Intravenous procaine is an exception and does not conform either to this classification or to the same stages of anaesthesia.

This paper is the result of a study in which the signs, symptoms and stages of procaine anaesthesia have been evaluated and it outlines a classification which is applicable to intravenous procaine.

A comparison of this classification with the classifications of other anaesthetics shows that sensitivity to the anaesthetic has previously not been taken into account in drawing up anaesthetic tables and classifications. As the procaine classification embodies the principles of other classifications, in addition to allowing for variations in sensitivity, it can, in its broad principles, be applied to other anaesthetic agents as well as to procaine.

* Includes excerpts from Chapters 2 and 3, Part 1, of a Thesis submitted for the Degree of Doctor of Medicine in the University of the Witwatersrand, Johannesburg.

Read before the anaesthetic section of the 37th South African Medical Congress, in Cape Town on 20 September 1949.

A modification of Guedel's classification to conform with that of procaine not only makes allowance for variations in sensitivity and dosage, but is also a sound basis for the teaching of the stages of anaesthesia and a constant reminder that patients vary considerably in their response to anaesthetic agents.

The procaine chart will be outlined as briefly as is consistent with clarity and it will be shown how this chart is applied to modify Guedel's classification.

REACTION AND DOSAGE IN ANAESTHESIA

Certain problems present themselves when one comes to analyse the effects of intravenous procaine in patients of the same build, height, weight, sex, race and state of health.

1. A dose X administered in Y seconds will produce marked stimulation and result in a convulsion in one patient and yet the same dose in the same period of time will produce depression in another patient.

2. A dose X in Y seconds will produce a certain level of anaesthesia uneventfully in a third patient and yet ten times this dose would be required to produce the same level of anaesthesia in a fourth patient.

3. A dose nine times X in Y seconds will have no effect on a fifth patient and yet a dose ten times X will produce a convulsion in this patient.

4. Excitement or delirium is often absent and is a variable factor from case to case, and a stage of excitement or delirium comparable with Guedel's second stage does not exist with intravenous procaine. The same applies to ether anaesthesia in that the stage of excitement or delirium is, often as not, a tranquil period bridging the interval between loss of consciousness and the onset of automatic respiration, and, although excitement or delirium may occur, it need not necessarily manifest itself.

A review of the effects of the short-acting barbiturates, e.g., sodium pentothal, sodium evipan, in comparable patients presents similar problems, viz.:

1. A dose P in S seconds will produce untoward effects in one case, and uneventful light surgical anaesthesia in another case and yet only several times this dose will produce the same level of anaesthesia in a third patient.

2. A dose P in S seconds will produce deep surgical anaesthesia in one case and yet four times the same dose in the same period of time will not produce anaesthesia in another patient.

3. A dose two times P will have no effect on a fourth case and yet a dose three times P will produce untoward effects in the same patient.

The signs and symptoms of intravenous procaine anaesthesia necessary for an evaluation of the stages of anaesthesia fall into two main groups. The one group consists of the regular or normal signs and symptoms of anaesthesia, referred to as the *signs of anaesthesia*. The other group consists of signs and symptoms of stimulation. These are evidence of sensitivity and are referred to as *sensitivity symptoms*.

A marked difference in dosage is necessary to produce corresponding degrees of anaesthesia in different patients. Some patients tolerate large quantities of anaesthetic before anaesthesia is recorded, while others show sensitivity to dosage, anaesthesia being produced with only small amounts of the anaesthetic. This variation in dosage is referred to as *Dose or D. sensitivity*. There is also a variation in the occurrence of the reaction or sensitivity symptoms, irrespective of the dosage used, and this is referred to as the *Reaction or R. sensitivity*.

REACTION SENSITIVITY

The signs and symptoms produced by procaine and all other anaesthetic agents occur in a certain order. For convenience these are referred to as the 'signs of anaesthesia a, b, c, d, e, f, g, h', in Chart 1.

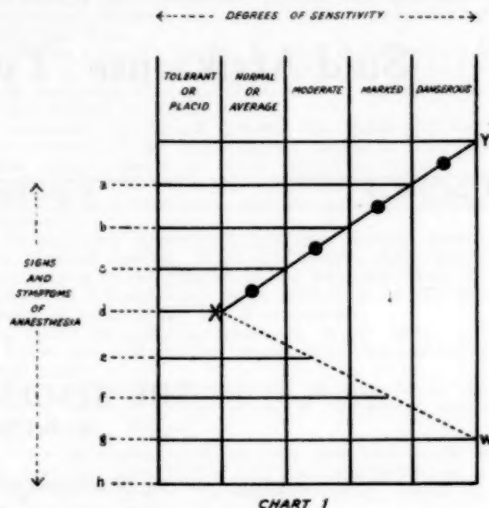
One or more of a further group of signs and symptoms, the sensitivity symptoms of intravenous procaine, indicate R. sensitivity. Most of these symptoms take the form of symptoms of stimulation and usually herald a convulsion. Although depression and coma may occur, they usually follow convulsions or other manifestations of excessive stimulation and these symptoms of reaction sensitivity are thus, on the whole, symptoms of excessive stimulation.

The time of occurrence of a symptom or sign of the sensitivity group in relation to a certain symptom or sign of the anaesthetic group, establishes the degree of sensitivity of the patient and places patients in one of five categories, viz.:

1. Tolerant or tranquil.
2. Normal or average sensitivity.
3. Moderate sensitivity.
4. Marked sensitivity.
5. Dangerous sensitivity.

These five degrees of sensitivity are illustrated in

Chart 1 and the line XY on this chart represents the commencement of reaction sensitivity symptoms.



1. *Tolerant or Tranquil.* Signs and symptoms of anaesthesia 'a', 'b', 'c', 'd', 'e', 'f', 'g' and 'h', occur and over-stimulation symptoms can usually not be produced at any level of anaesthesia.

2. *Normal or Average Sensitivity.* Symptoms 'a', 'b', and 'c', occur before any signs or symptoms of over-stimulation are evident.

3. *Moderate Sensitivity.* Signs or symptoms of over-stimulation occur before symptom 'c' can be produced.

4. *Marked Sensitivity.* Symptoms of over-stimulation occur before symptom 'b' can be produced.

5. *Dangerous Sensitivity.* Symptoms of sensitivity appear before any other.

Although intravenous procaine is a stimulant, a careful observation and recording of blood pressure, pulse rate, and other signs and symptoms during procaine anaesthesia, shows that depression is produced in the deeper levels of anaesthesia and that a profound depression occurs at the stage of overdose. (See Chart 5c, the completed chart for procaine anaesthesia.)

Over-stimulation can only be produced with difficulty in a tolerant patient who has exhibited 'a', 'b', and 'c', and it becomes increasingly difficult to produce over-stimulation with the advent of each new sign of anaesthesia. Over-stimulation can no longer be produced when 'g' occurs.

A line XW represents the fact that patients with lesser degrees of sensitivity stop showing sensitivity symptoms before 'g' and a triangle WXY is formed outside of which over-stimulation does not occur, and this triangle is hence referred to as the *triangle of over-stimulation*.

The areas of the triangle applicable to the respective sensitivity groups depicts less sensitive patients as having a smaller 'area' of stimulation to negotiate than more sensitive patients and they can thus proceed more

easily to deeper levels of anaesthesia. It also serves as a reminder that although the same stages of anaesthesia are presented in all the groups, sensitivity symptoms are more severe where sensitivity is greater and replace one or more of the stages of anaesthesia. Clinical use of the drug verifies the foregoing.

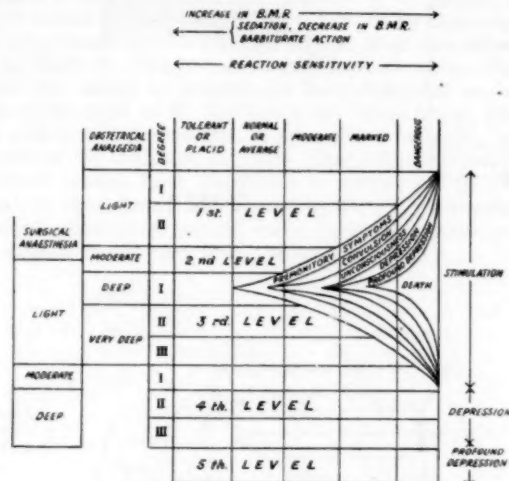


CHART 5c

The same prodromal symptoms are usually observed irrespective of the point of entrance into the triangle and the triangle is thus shown in Chart 5c as being bordered by a zone of prodromal symptoms. These herald a convulsion with its subsequent depression, coma and profound depression occurring as a result of a large initial stimulus or a marked degree of sensitivity.

Although no fatalities have occurred, it is believed that, in addition to an overdose, a fatality could readily result from a large initial stimulation, from a large procaine dosage immediately prior to the onset of a convulsion, or as an immediate accident in an exceptionally R. sensitive patient.

The reaction sensitivity of different patients to intravenous procaine varies considerably, but in the same patient it varies only slightly from day to day dependant mainly on the speed of injection. Thus, the position of an individual's reaction sensitivity for intravenous procaine is for that individual normally situated in a certain sensitivity zone, and there is no reason to suppose that other anaesthetics are any different in this respect.

By applying the triangle of over-stimulation to Guedel's stages of anaesthesia a chart is produced in which a triangle (of excitement) represents the period of excitement or delirium, the second stage being a tranquil analgesic period bridging loss of consciousness with the onset of automatic respiration.

This triangle indicates the causation of the variable occurrence of excitement and delirium after and even before the loss of consciousness and illustrates why different patients have different reactions to anaesthetic agents. (See Chart 5b.)

Certain factors affect a patient's normal reaction sensitivity and it has been observed that:

1. Fear, excitement, apprehension and emotional excitement produce an increased R. sensitivity.

2. When fever, pain or endocrine imbalance are present, patients have a greater R. sensitivity than when they are absent.

3. Children are more liable to over-stimulation than adults, i.e., they have a greater R. sensitivity, and they also tolerate larger amounts of anaesthetic weight for weight than adults. It has also been noted that an increase in the basal metabolic rate in adults causes a shift to the right of R. sensitivity. A larger dose of anaesthetic is also required. (This will be dealt with under the section on dose sensitivity.)

Thus, an increase in the basal metabolic rate, fear, excitement, fever, or other such factors increases the sensitivity of the individual, producing a shift to the right of the zone of sensitivity which is normal for that individual, while sedation produces a shift to the left.

It is thus shown why individual patients vary in their reaction to anaesthesia according to the circumstances obtaining at the time of administration, e.g., a patient who would not exhibit excitement in the second stage of inhalation anaesthesia and is exposed to such factors as fear, increased basal metabolic rate, excitement or other such factors, will have a shift to the right of the zone of sensitivity. Excitement or delirium will occur in the second stage and possibly even before the loss of consciousness. Conversely, sedation, etc., will produce a shift to the left and a tranquil second stage will result (Chart 5b).

DOSE SENSITIVITY

Reaction sensitivity accounts for variations in reaction, but variation in dosage is a separate entity. In the same way as patients fall into one of several reaction sensitivity categories, so do they also fall into one of many dosage categories.

Markedly different amounts of the same anaesthetic are often required to produce identical degrees of anaesthesia in different patients: an amount of anaesthetic sufficient to produce uneventful anaesthesia in one patient being totally inadequate in another, one patient requiring not only a much larger quantity of anaesthetic than the other, but also taking a longer time to be anaesthetised. This is referred to as the D. sensitivity.

In testing for reaction and dose sensitivity the following variations are noted in patients of the same reaction sensitivity group:

1. *In Reaction Sensitive Patients.* In one patient a small amount of intravenous procaine produces early sensitivity symptoms, and yet in another patient the same sensitivity exists but is only evidenced after a large amount has been administered.

2. *In Reaction Tolerant Patients.* In one patient a small amount of procaine produces unconsciousness. Sensitivity symptoms do not occur and yet in another patient a large amount is required to produce the same level of anaesthesia with the same absence of sensitivity symptoms, and a longer time is also required for the production of anaesthesia.

This variation of dosage in producing the same level of anaesthesia is greater with procaine than with other anaesthetics. How wide this variation may be is shown by the fact that the writer has used 7.0 gm. in 35 minutes

comparable degrees of anaesthesia in different patients, and as to the time required for the production of such anaesthesia.

The factors producing a shift to the right of reaction

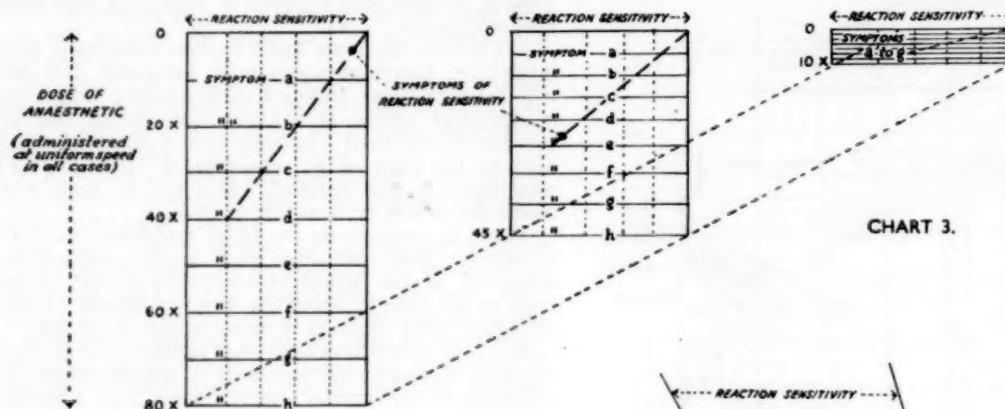


CHART 3.

in one patient and 1.0 gm. in 55 minutes in another patient for similar depths of anaesthesia; has produced unconsciousness with 0.015 gm. in a particular patient and has recorded no detectable effect on another patient with 1.4 gm. administered in the same period of time as in the previous patient.

The signs of anaesthesia are the same in all patients. If a uniform rate of administration be employed in all cases and the quantity of the drug used be charted on the abscissa of a graph (as illustrated in Chart 3), and the signs and symptoms of anaesthesia, a, b, c, d, e, f, g, and h, be charted as lines parallel to the axis at the dosage at which they occur, the graphs of certain individuals will show an expansion or a contraction of the stages of anaesthesia in relation to the average.

Thus, a dose X which will produce analgesia in one patient, may produce anaesthesia in another patient and yet constitute a gross overdosage in a third patient. This variation in dose sensitivity is diagrammatically illustrated in Chart 4 and it is possible to compare patients 'A', 'B', and 'C' who have respectively dose tolerance, average response and dose sensitivity.

The stages of anaesthesia are contracted in patient 'C' and expanded in patient 'A'. There is thus produced a 'wedge of anaesthesia' where dosage 'X' will not produce loss of consciousness in patient 'A', will produce loss of consciousness in patient 'B' and will constitute a gross overdose in patient 'C'.

This increase or decrease in dosage is accompanied by a corresponding change in the time required for the production of anaesthesia. The individual response to the various stages of anaesthesia is not affected, there being only a marked difference in the dosage and time required for the production of identical signs and symptoms of anaesthesia. The chart of dose sensitivity thus illustrates the fact that patients vary considerably both as to the quantity of the drug required to produce

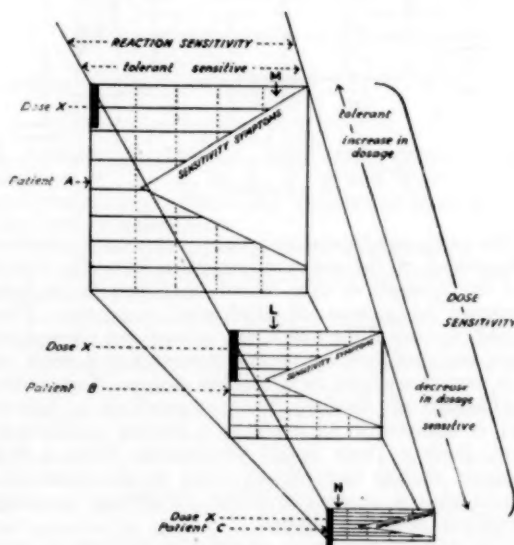


CHART 4

sensitivity, viz., increase in B.M.R. etc., also produce an expansion of the levels of anaesthesia and larger doses of anaesthetic are required, whereas with adequate sedation a contraction of the levels occurs and smaller dosages are effective.

Applying this to the modified Guedel's classification we find that excitement, fear, or an increase in the basal metabolic rate produces an expansion of the stages of anaesthesia in addition to bringing about a shift to the right of the reaction sensitivity. Not only is excitement or delirium practically inevitable but a larger dose of anaesthetic is required and induction takes longer. Adequate sedation, by diminishing the excitability of the patient and/or reducing the B.M.R., results in a smaller dose of anaesthetic and a shorter period in traversing the stages of anaesthesia. As there is also a change in

R. sensitivity, there is an absence of excitement or delirium as well, i.e., a movement has occurred down the 'wedge of anaesthesia', a narrowing has been produced in the stages of anaesthesia and there has been a shift to the left of the R. sensitivity.

Chart 4 also illustrates the reaction of a patient in whom excitement or delirium would probably not occur and who would have a tranquil second stage (see arrow 'L' in Chart 4). Due to excitement, fear, or some other factor, the stages of anaesthesia have expanded and a shift to the right of R. sensitivity has taken place, 'M'. Not only is a larger amount of anaesthetic required, but excitement or delirium are now practically inevitable. Sedation would have produced a narrowing of the stages of anaesthesia and a shift to the left. A smaller dose of anaesthetic would have been necessary and anaesthesia would have been uneventful, 'N'.

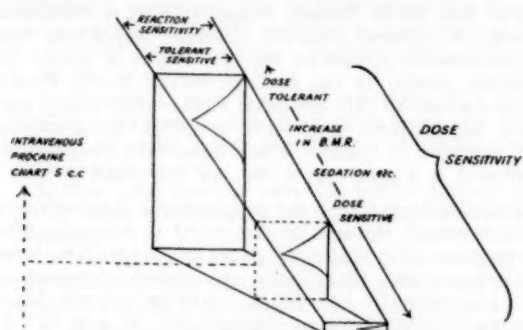


CHART 5A

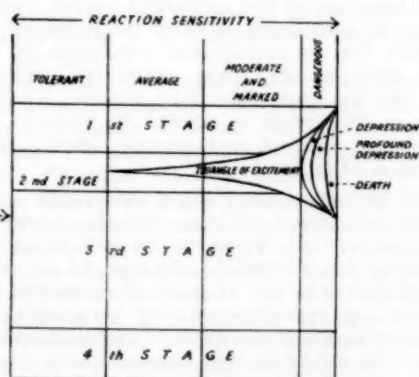


CHART 5B

Chart 5a shows the classification for intravenous procaine and the modification of Guedel's classification. The latter is believed to be applicable to all anaesthetic agents irrespective of the route of administration or method used. Not only does it offer an explanation of untoward occurrences during anaesthesia but it is also a constant reminder that variations in dosage and reaction can be expected from patient to patient. It will

be noted that the triangle of over-stimulation which has been evaluated for intravenous procaine is shown as larger than the triangle of excitement depicted for other anaesthetic agents. It is also possible that the latter should be depicted as smaller still in the case of anaesthetics such as pentothal sodium.

Charts 5a, b and c suggest themselves as a possible explanation of many untoward occurrences in anaesthesia, as it seems reasonable to attribute sudden death in induction and other untoward occurrences in anaesthesia due to anaesthetic (with the exception of gross overdose) to a sensitivity comparable to procaine sensitivity.

These charts thus offer themselves as a possible explanation for many untoward occurrences in anaesthesia and present a new concept of the stages of anaesthesia as well as a new concept of sensitivity to anaesthetic agents. They not only make allowances for variations in sensitivity and dosage, but are also a sound basis for the teaching of the stages of anaesthesia and a constant reminder that patients vary considerably in their response to anaesthetic agents both as regards dosage and reaction.

SUMMARY

Anaesthetics vary in their effects and reactions in different individuals and there is no standard dose of any anaesthetic which will produce identical effects in every case, but techniques of administration and classifications can be determined because the signs and symptoms produced by each anaesthetic are fairly constant.

Sensitivity to the anaesthetic has previously not been taken into account in drawing up anaesthetic classifications. This paper is the result of a study of intravenous procaine and presents a new concept of the stages of anaesthesia in which both sensitivity to dosage and to untoward reactions is taken into account in arriving at a completed anaesthetic chart.

Two types of sensitivity are described, dose sensitivity and reaction sensitivity. The first accounts for sensitivity to the quantity of the anaesthetic used, and the second accounts for the different categories of sensitivity in reaction that can occur. The time of onset of excitement or delirium is a variable factor which has been determined and charted in relation to the signs and symptoms of anaesthesia, and from this a triangle of excitement or delirium is defined and placed in position in the chart of procaine anaesthesia.

Guedel's classification is not applicable to intravenous procaine anaesthesia, but the chart for intravenous procaine is, in its broad principles, applicable to inhalation and other anaesthetics. A modification of Guedel's classification is thus presented which conforms to the classification for intravenous procaine. This classification defines the second stage as a tranquil analgesic period bridging the interval between loss of consciousness and the onset of automatic respiration, the occurrence of excitement or delirium being variable and dependent not only on the sensitivity of the individual but also on the basal metabolic rate at the time of administration.

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VAN DIE REDAKSIE

SCHISTOSOMIASIS

Volgens sommige skattings is daar 150 miljoen mense wat deur schistosomiasis aangetas word. Dis 'n siekte wat baie mense onbekwaam maak vir werk en aansienlike ekonomiese verlies dwarsdeur die wêreld veroorsaak.

Die eerste Wêreldgesondheidsbyeenkoms het derde-rangse voorrang aan verskeie parasitiese siektes gegee en aan die hand gedoen dat die eerste onderwerp vir studie schistosomiasis moet wees. In 'n onlangse artikel¹ in die *Bulletin of the World Health Organization* gee Sir Aly Shousha, Pasha, 'n kort oorsig van die probleem oor die algemeen en beskryf dan die beginsels en metodes van bestryding wat die afgelope paar jaar met welslae in Egipte toegepas is.

Dit is welbekend dat die voorkoms van schistosomiasis dwarsdeur die wêreld afhang van die aanwesigheid van skulpdier wat tussengashere van slakwurms is. Feitlik die hele vasteland van Afrika is besmet, sowel as lande in albei halfondes wat tussen breedtegrade 38 N. en 35 S. lê; daar is egter sekere streke tussen hierdie breedtegrade wat vry van parasiete is. Sekere schistosoma (*Schistosoma haematobium* veral) is spesifiek parasiete van die urogenitale stelsel, ander (*S. mansoni*, *S. japonicum*) vind 'n tuiste in die spysverteringstelsel. Hulle veroorsaak patologiese toestande in verskillende organe weens die giftige stowwe wat hulle uitskei en die eiers wat hulle los. Die kliniese voorkoms van die siekte word gekenmerk deur bloedloosheid, verhinderde ontwikkeling, kragverlies en algemene swaakteit en die vooruitsig is dikwels die dood.

Die enigste geneesmiddel waarmee tot dusver sukses behaal is, is kalium-antimoontaartraat. Behandeling met dié middel is in 1919 in Egipte ingevoer. By verskillende provinsiale hospitale is byvoegings gemaak en in 1928 is 'n spesiale afdeling van die Ministerie van Volksgeondheid belas met die toesig oor eenhede wat wurmmiddels toepas. In 1924 is 'n eenvormige stelsel van genesingsregistrasie aanvaar. Die aantal behandelde gevalle het geleidelik toegeneem van 46,945 in 1924 tot 388,485 in 1945. In 1941 is behandeling verpligtend gemaak. Mobiele eenhede is ingestel vir ondersoek en behandeling in dorpe wat ver van die groot sentrums af lê. In die toekoms sal eenhede van beddens voorsien word vir pasiënte wat opvallend bloedloos of verswak is.

In Egipte het die aantal en die ernstige aard van slyk komplikasies aansienlik afgeneem as gevolg van die uitgebreide toepassing van die behandeling. Die syfer

EDITORIAL

SCHISTOSOMIASIS

Schistosomiasis, which, according to certain estimates, affects 150 million people, incapacitates many for work and causes considerable economic loss throughout the world.

The first World Health Assembly gave a third-rank priority to several parasitic diseases, suggesting that schistosomiasis should be the first object of study. In a recent article¹ in the *Bulletin of the World Health Organization*, Sir Aly Shousha, Pasha, after briefly outlining the problem in general, describes the principles and methods of control which have been successfully employed in Egypt during the last few years.

It is well-known that the geographical distribution of schistosomiasis throughout the world is determined by the presence of molluscs which act as intermediate hosts for trematodes. Practically the entire continent of Africa is infested, as well as countries in both hemispheres, situated between latitudes 38° N. and 35° S., there being, however, certain areas between these latitudes which are free from parasites. Certain schistosomes (*Schistosoma haematobium*, in particular) are specific parasites of the urogenital system, others (*S. mansoni*, *S. japonicum*) settle in the digestive system. They give rise to pathological conditions in various organs through the toxic substances which they excrete and the eggs which they deposit. The clinical picture of the disease is marked by anaemia, underdevelopment, asthenia and general debility, and the prognosis is often fatal.

So far, the only remedy which has proved successful is potassium antimony tartrate, treatment with which was introduced into Egypt in 1919. Annexes were instituted in various provincial hospitals and, in 1928, a special section of the Ministry of Public Health was entrusted with the supervision of anthelmintic units. In 1924, a uniform method of cure-registration was adopted. Treatment has been carried out on a growing scale, and the cases treated increased from 46,945 in 1924 to 388,485 in 1945. In 1941, treatment was made compulsory. Mobile units were established for examination and treatment in villages far from important centres. In the future, units will be provided with beds for markedly anaemic or debilitated patients.

In Egypt, the number and severity of surgical complications have greatly diminished as a result of the extensive application of the treatment, the incidence

1. Bull. World Hlth Org. 1949, 2, 19.

1. Bull. World Hlth Org. 1949, 2, 19.

vir sulke komplikasies het gedaal van 50 per 10,000 gevalle in 1925 tot 2 per 10,000 in 1933. Die behandeling met kalium-antimoon-tartraat, wat heelwat ongemak veroorsaak, word deur pasiënte gevrees. Shousha, Pasha, beklemtoon die voordeel wat verbonde sal wees aan 'n doeltreffende middel wat in die spiere of onderhuids ingespuut kan word en wat pasiënte maklik sal verdra.

Behandeling moet gepaard gaan met voorbehoedmaatreëls want eersgenoemde alleen kan onmoontlik die siekte uitroei wat nou na dele van die land versprei wat deur besproeiing ontwikkel word. Dit lyk of die enigste manier om die siekte uit te roei is om die skulpdier te vernietig wat die tussengashere van schistosomose is. In 1940 het die Egiptiese Ministerie van Volksgegesondheid met die hulp van die Rockefeller-fonds 'n spesiale afdeling ingestel vir slakbestryding. Hierdie afdeling het in 'n departement met 'n groot organisasie ontwikkel wat in meer dan 320 vaste sentrums optree en 10,000 werkers en personeel in diens het. Verskillende metodes van bestryding in die veld is op die proef gestel.

1. Skoonmaak van besmette waterlope deur gras en slakke te verwyder. Die skoonmaak word met skoffels gedoen en nete word gebruik om skulpdier en los plante te verwyder.

2. Om watervore vir tien dae tot 'n maand te laat droog staan is nie doeltreffend nie aangesien slakke dit oorlewe.

3. Die vervanging van watervore deur 'n voor langs die bestaande voor te grawe en die grond wat uitgespit word in die ou voor te gooi, is ook al probeer.

4. Ondergrondse besproeiing, wat as 'n proefneming uitgevoer is, het uitstekende resultate gelever. Aanvanklik sal die koste aansienlik wees maar die resultate sal dit binne 'n paar jaar vergoed.

Kopersulfaat is as die slaggif gekies wat die minste nadele het. Dit is 'n kragtige skulpdiergif selfs in baie klein sterktes.

Die nut van slakbestryding is reeds in Egipte bewys. In die provinsie Faiyûm was 25% van die waterlope met slakke besmet. Na vier jaar van bestrydingswerk was slegs 2% nog besmet terwyl gedurende dieselfde tydperk die aantal slakke in besmette strome versamel van 63 tot 5 slakke per 100 skeppe gedaal het.

Onlangse opnames van die voorkoms van schistosomiasis in Brasilië, wat vir baie lank as vry van die siekte beskou is, het aan die lig gebring dat schistosomiasis baie algemeen voorkom in die meerderheid van die provinsies waar opnames gedoen is. Volgens die beskikbare gegewens is dit eger nie moontlik om die omvang van die siekte dwarsdeur die land noukeurig vas te stel nie. Die voorkomssyfer kan by benadering op 6.2% van die bevolking gestel word (wat aandui dat byna 3,000,000 persone besmet is) en hierdie persentasie is waarskynlik laer dan die werklike syfer. Die opnames in Brasilië steun die mening dat die omvang van die verspreiding van schistosomiasis tot nog toe nie genoegsaam besef is nie. In 1947 is 'n wetsontwerp by die Kongres van Brasilië ingedien wat voorsiening maak vir die instelling van 'n nasionale schistosomiasediens in die Volksgegesondheidsdepartement van die Ministerie van Onderwys en Gesondheid.

of such complications dropping from 50 per 10,000 cases in 1925 to 2 per 10,000 in 1933. The potassium antimony tartrate treatment, which causes considerable discomfort, is dreaded by patients. Shousha, Pasha, emphasizes the advantage which would be derived from an effective drug capable of being injected intramuscularly or hypodermically and which would be easily tolerated by the patients.

Treatment must be accompanied by prophylactic measures, for the former alone cannot possibly eradicate the disease, which is spreading to parts of the country which have been opened up to irrigation. The only method of eradicating the disease would seem to be destruction of the molluscs which are the intermediate hosts of schistosomes. In 1940, the Egyptian Ministry of Public Health, with the help of the Rockefeller Foundation, instituted a special snail destruction section. This section has grown into a department with a large organization, operating in over 320 permanent centres and employing 10,000 workers and staff. Different methods of control in the field have been tried:

1. Clearance of infested water-courses of their weeds and snails. Clearing is done by means of hoes, while nets are used for removing molluscs and plant refuse.

2. Drying of canals for periods of ten days to one month is not effective, as snails survive drying.

3. The canal alternation system which entails the digging of a canal alongside an existing canal, the earth dug out of the new one being thrown into the old, has also been tried.

4. Underground irrigation, carried out on an experimental basis, furnished excellent results. The initial cost would be considerable, but in a few years could be compensated by returns.

Copper sulphate was chosen as the snail poison having the fewest drawbacks. It is a potent molluscicide, even in very small concentrations.

Snail control has already proved its worth in Egypt. In the province of Faiyûm, 25% of the water-courses were infested with snails. After four years of control work, only 2% were still infested, while, during the same period, the number of snails collected in infested streams dropped from 63 to 5 snails per 100 dips.

Recent surveys carried out on the distribution of schistosomiasis in Brazil, which has for a long time been considered free from the disease, have shown that schistosomiasis is highly prevalent in most of the provinces surveyed, although available data do not make it possible to depict accurately the extent of the disease throughout the country. The incidence-rate may be roughly estimated at 6.2% of the population (indicating nearly 3,000,000 persons infected), this percentage being probably lower than the real rate. The surveys made in Brazil lend weight to the belief that the extent of the distribution of schistosomiasis has not hitherto been sufficiently realized. In 1947, a bill was presented to the Brazilian Congress providing for the creation of a national schistosomiasis service in the Public Health Department of the Ministry of Education and Health.

GASTROSCOPY—AN AID TO THE DIAGNOSIS OF GASTRIC PATHOLOGY*

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Gastroscopy is the inspection of the interior of the stomach with an endoscopic tube—a gastroscope.

It is an important adjunct to radiological examination and is in no sense a competitive method, but an additional one. Pathological changes may be seen with the one which are invisible with the other. X-ray examination should always precede gastroscopy, as the gastroscopist must have the prior knowledge that the oesophagus is normal.

HISTORICAL NOTE

The great clinician Kussmaul in the sixties of the last century passed a metal tube of 13 mm. diameter down the oesophagus of a sword swallower, thus demonstrating that the oro-pharynx, oesophagus and stomach could be brought into one straight line.

After this demonstration numerous varieties of rigid gastroscopes were used but not until Schindler in 1922 overcame the general prejudice against gastroscopy, did this type of investigation find a place in the investigation of gastric diseases. He did this by doing a large number of gastroscopies and publishing his monumental work in 1923.

However, gastroscopists had always desired a safer, flexible instrument and in 1932 with the advent of Schindler's flexible gastroscope, gastroscopy definitely established itself as a valuable procedure in diagnosis.

Herman Taylor of the London Hospital further improved the instrument. This gastroscope is partly rigid and partly flexible. The flexible distal portion, carrying the light and lens aperture, can be angled both forward and backward by means of a knurled knob attached to the proximal end. This instrument will be demonstrated and all subsequent discussion is based on the use of the Herman Taylor gastroscope as made by the G.U. Co., in London.

Preparation of the Patient for Gastroscopy. Too much preparation is unnecessary and inadvisable as the patient will become tense and anxious. It has been advised that gastroscopy should be a consulting room procedure, but I have found it preferable to examine the patient in his ward or in the ante-room of the theatre.

The patient is instructed to have nothing to eat or drink on the day of the examination; the last meal being taken on the previous evening.

One hour prior to examination an injection of morphine gr. $\frac{1}{4}$ and Hyoscine gr. $\frac{1}{150}$ is given. One-half hour later the patient is given a 25 mgm. tablet of anethaine to suck. The respirations are counted and if they are more than 16/min. a further morphine gr. $\frac{1}{4}$ may be given to an apprehensive patient. After the anethaine tablet is dissolved a Levine tube is passed

through the nose into the stomach. The patient is placed on his left side in Trendelenburg position and the stomach aspirated. On passing the Levine tube the gastroscopist or Sister-in-charge will note the degree of anaesthesia of the pharynx. Should this be inadequate a further anethaine tablet is sucked.

Introduction of the Gastroscope. All movements must be gentle. The patient should be continually encouraged and questions such as 'have you any pain?' should not be asked. As stated previously if it be found that after a few attempts the instrument cannot be passed smoothly and easily, the attempt should be abandoned. This occurs extremely rarely in competent hands. The gastroscope is more easily passed in edentulous patients.

The distal portion of the gastroscope being in the stomach, the light is switched on and a small amount of air inflated. The patient is then told that he may feel like belching but should attempt to retain the air.

Orientation in the Stomach. Orientation in the large cavity of the stomach is difficult and must be carefully learned. The instrument is first introduced into the lowest depths of the stomach and the pylorus and antrum visualised—this is depth I.

The gastroscope is rotated through 360° so that the lesser curve, posterior wall, greater curve and anterior wall are seen. The instrument is then gently withdrawn into the midportion of the stomach—depth II and the same rotatory movement made. Finally the instrument is still further withdrawn to depth III—the subcardiac region. Usually but not always, three areas remain invisible to the gastroscopist. These are a small area of the lesser curve of the antrum, a small segment of the greater curvature and that portion of the posterior wall on which the instrument rests. After completion of the examination, the light is switched off and the gastroscope gently withdrawn. The patient usually belches up a great deal of air and feels none the worse for the investigation.

He may go home or to work immediately but should be warned not to drink any liquids for 1-2 hours as the pharynx is anaesthetised and fluid may enter the larynx.

Gastroscopic Appearance of the Normal Stomach. Normally the gastric mucosa is of an orange-red colour, the surface is smooth, the rugae are comparatively small and flatten out well with air inflation. Numerous highlights are seen on the mucosa.

The angulus which coincides with the incisura angularis is seen as a smooth hyperbolic curve. The angulus divides the stomach into a proximal body and a distal portion—the pyloric antrum. In the antrum peristaltic waves may be seen to commence at the angulus and pass smoothly towards the open pylorus which then closes tightly with a stellate formation. No blood vessels are visible in the normal mucous membrane. Mucus and gastric juice which were not aspirated or which were lying between the folds to be freed on air

*This paper was read at the Medical Congress held in Cape Town September 1499.

inflation, collect in the fundus as a 'lake of mucus' which is either transparent or of a whitish or greyish colour. The lesser curvature is foldless. The folds of mucosa on the anterior wall are delicate. On the posterior wall the mucosal folds are numerous and thick, especially when they are close to the objective. The cardia is seen as a whitish-red sickle-shaped fold, frequently covered with air bubbles and flowing in front of the objective with each inspiration like a wave.

INDICATIONS, CONTRA-INDICATIONS AND DANGERS OF GASTROSCOPY

It is my considered opinion that no case in which gastric pathology is suspected can be considered as adequately examined if the gastroscopic investigation be omitted. The reasons for so dogmatic a statement will become obvious with subsequent discussion.

It must again be emphasised that gastroscopy is an important adjuvant to X-ray examination. It is in no way a competitive method but an addition to our armamentarium in gastric diagnosis.

A. ABSOLUTE CONTRA-INDICATIONS

(i) *Obstruction of the oesophagus and at the cardia.* These cannot always be excluded by radiological examination, but the introduction of a size 12 Ewald tube proves whether the passage-way is clear. This, therefore, should always be done prior to gastroscopy.

(ii) *Aortic Aneurysm.* If suggested by the physical examination, aortic aneurysm should be excluded by X-ray of the chest.

(iii) *Acute corrosive and phlegmonous gastritis.* Gastroscopy should not be used in the investigation of such cases, as perforation of the stomach wall is almost inevitable.

(iv) *Oesophageal Varices.* Severe haemorrhage may be precipitated by the passage of a gastroscope. Such varices, if suspected, can *nearly always* be excluded by prior X-ray examination.

B. RELATIVE CONTRA-INDICATIONS

(i) *Dyspnoea.* Due to cardia or pulmonary disease.

(ii) *Severe Kypho-scoliosis of the spine.* In such a case the oesophagus cannot be straightened. Perforation of the oesophageal wall may attend the attempted passage of a gastroscope in these cases.

(iii) *Achalasia of the cardia.* This is self-explanatory.

(iv) *Oesophageal diverticulum.*

(v) *Psychosis.* Patients suffering from a psychosis cannot co-operate. Lack of co-operation renders the diagnostic value of the examination decidedly dubious.

THE DANGERS OF GASTROSCOPY

These may be briefly summarised. In the hands of a well-trained gastroscopist injury to either oesophagus or stomach is rare. However, it must be emphasised that if the instrument cannot be passed easily and smoothly, or if the patient is unco-operative, attempts to pass the gastroscope should be abandoned even if one is demonstrating the method to a group of colleagues.

The rigid instrument is rarely used to-day and, if used,

is apt to be followed by more mishaps than in the use of the flexible one.

Perforation of the oesophageal wall, especially at the cardia has been recorded but with adequate care should never occur.

The straight resistance to the passage of the gastro-scope felt at the cardia should not be overcome by pressure. Gentle rotation of the instrument or inflation of a small amount of air are usually sufficient to overcome the resistance.

Perforation of the gastric wall generally occurs only with careless gastroscopy. However, it should be noted that with an atrophic gastritis associated with a carcinoma, especially near the cardia, the stomach wall may be so thin that the rubber finger-tip of the instrument may pass through it without the gastroscopist being aware of the mishap. With the introduction of air into the stomach the patient will complain of pain in the abdomen. This should make the examiner suspicious of the accident. Although such a mishap requires laparotomy with closure of the perforation, it is not a catastrophe as the stomach is empty and diagnosis is early. Such an accident occurred to me whilst gastroscoping an elderly male suffering from gastric carcinoma, referred by Prof. Underwood. Closure of the perforation was performed within two hours by the Professor. The stomach wall was found to be thin and atrophic. Recovery was uneventful and subtotal gastrectomy done some weeks later. To-day, with the flexible gastro-scope, gastroscopies can already be reckoned in the tens if not hundreds of thousands with a very small percentage of accidents.

A questionnaire sent by Schindler to a number of gastroscopists elicited one fatal perforation of the oesophagus, eight perforations of the stomach—all recovered, and one perforation of the jejunum recovered. The latter case was gastroscoped after subtotal gastrectomy. These accidents occurred in a series of 22,351 gastroscopies, the mortality in this series being .004%. Schiff has reported a series of 1,000 gastroscopies with two gastric perforations, one terminating fatally.

LIMITATIONS OF GASTROSCOPY

Negative gastroscopic examinations do not exclude the existence of a pathological lesion in the stomach. A number of blind spots exist. Some areas of the stomach can never be seen through the gastro-scope. The visibility of others depends upon the shape of the stomach, e.g., in the majority of cases the antrum and pylorus can be well visualised, whilst in others, the angle between the descending and ascending parts of the lesser curvature is too acute to enable the antrum to be brought into view.

Although certain blind spots do exist, they have been minimised with the advent of the Herman Taylor instrument which allows the lens system to be altered into either a prograde or retrograde one.

THE VALUE OF GASTROSCOPY IN DIAGNOSIS

Certainly the most important use for the gastro-scope is in the diagnosis of gastritis of various kinds.

Guyer compared the radiological and gastroscopic findings in 200 patients with the following results:

RADIOLOGICAL FINDINGS:

Diagnosis:	No.	%
X-ray normal	147	73.5
Duodenal ulcer	17	8.5
Duodenitis	15	7.5
Gastric ulcer	7	3.5
Gastritis	5	2.5
Other findings	9	4.5

GASTROSCOPIC FINDINGS:

Diagnosis:	No.	%
Normal	95	47.5
Gastric (all types) ..	88	44
Gastric ulcers	7	3.5
Healed gastric ulcers ..	9	4.5
Adenoma	1	0.5

It is common knowledge that patients frequently present themselves with a history of dyspepsia suggestive of peptic ulceration but no evidence of ulceration can be found with barium meal examination. The ability to see the gastric mucosa constitutes the only reliable means of diagnosis in most cases. Unfortunately X-ray examination frequently fails to demonstrate the gastritis. The examination of such a case is incomplete without thorough gastroscopy.

In competent hands, gastroscopy is so simple and so satisfying a procedure that it is my considered opinion that no case in which there is either a proved or suspected lesion in the stomach, should be regarded as completely investigated without its aid. Details of diagnostic points in gastroscopy will be discussed later, suffice it here to say that in cases of gastric ulcer a distinction between benign and malignant ulcer can often be made and furthermore the healing of a gastric ulcer can be readily followed by monthly gastroscopic examinations. The latter is of great importance as it is generally accepted that if a gastric ulcer fails to heal in six months and remain healed under an adequate medical regime suspicions as to its benignity should be raised and gastric resection contemplated. In the case of gastric carcinoma the question arises as to whether gastroscopy will help to improve the surgical results or not.

Gastroscopic examination is of importance in gastric carcinoma for:

- The diagnosis of carcinomata of minimal size.
- To differentiate between benign and malignant ulcers.
- To determine the operability of a carcinoma.
- To differentiate between the macroscopic types of carcinomata prior to operation.

(a) *The Diagnosis of Carcinomata of Minimal Size.* It is unanimously agreed that many more small operable carcinomata would be diagnosed if all patients complaining of minor abdominal distress could be thoroughly examined without delay. The chief method in such cases is, of course, X-rays. However, it has been shown that in a number of cases gastroscopy will help and in some even be superior to X-rays. It must again be stressed that these methods of examination are not competitive but complementary. Unfortunately patients who have harboured in their stomachs a small operable

carcinoma do not present themselves for examination, either because the lesion has produced no symptoms or because the symptoms are so mild that the patients do not consult a doctor.

There is, however, a second method of achieving early diagnosis of gastric carcinoma, i.e., when the disease is producing no symptoms. Certain diseases of the stomach e.g., atrophic gastritis and adenomata may be the soil on which a malignant growth develops. Early diagnosis of chronic atrophic gastritis may lead to an early diagnosis of carcinoma. The diagnosis of atrophic gastritis is only possible gastroscopically. When such a diagnosis has been made, X-ray and gastroscopic re-checks should be made at three-monthly intervals.

(b) *Differentiation between Benign and Malignant Ulcer.* The question is often asked—'How can a distinction between benign and malignant ulcer be made gastroscopically when even after excision of the lesion it is extremely difficult for the pathologist to differentiate between the two?' It is generally forgotten that the excised specimen is a piece of dead, lifeless tissue whereas with the gastroscope we see the living tissue filled with circulating blood. Gastroscopy is not infallible but it permits of a greater degree of accuracy in diagnosis than any other method.

On gastroscopic examination the benign ulcer is seen to have a sharp, punched-out edge, with a fairly clean base. The edge of a carcinomatous ulcer blends with the surrounding mucosa which is usually nodular and the base contains dirty looking sloughs. Patients over 35 years of age who have been shown to have a gastric ulcer should be gastroscopied before medical treatment is instituted as the malignant character of the ulcer may be observed.

(c) *Determination of the Operability of Gastric Carcinoma.* Infiltration of the mucosa by carcinoma may influence the surgical decision. However, it must be emphasised that infiltration of the muscularis or serosa may have occurred without evidence of infiltration of the mucosa. If the tumour is seen to have infiltrated the cardia then obviously transection through the oesophagus will have to be done to extirpate the disease, if it is operable. On the other hand, sharp demarcation of the tumour may be observed gastroscopically and this fact may encourage the surgeon to consider gastric resection. The precise situation of the growth may be determined gastroscopically and thus the type of operation, e.g., abdominal, thoracic or abdomino-thoracic can be planned. I examined an elderly male suffering from a high lesser curve carcinoma, diagnosed radiologically. The surgeon wished to know pre-operatively whether there was sufficient uninvolved gastric mucosa proximal to the tumour to warrant a high subtotal gastrectomy or whether a total gastrectomy should be done. Gastroscopically, approximately 1½ inches of normal mucosa was seen proximal to the growth on the lesser curve. At operation the surgeon was able to perform a high gastric resection with gastrojejunostomy.

(d) *Diagnosis of Macroscopic Types of Carcinomata prior to Operation.* It is considered by a number of authorities that the prognosis of gastric carcinoma depends less on the

size and microscopic character of the tumour than on its macroscopic type. With large tumours, the prognosis is not good but there are a number of cases on record in which the tumour was the size of a fist and in which resection led to a complete cure. Prior to the use of gastroscopy as a pre-operative procedure, typing of gastric carcinomata was impossible. Typing of such growths pre-operatively may prove to be one of the most important guiding procedures to the surgeon.

The classification put forward by Borrmann is generally known and widely accepted. Gastroscoically the following macroscopic types are seen:

(i) *Polypoid Carcinoma*. This is a sharply limited hemispherical tumour having irregular nodularities on its surface. It occurs in 2.9% of cases of gastric carcinoma and gives a good operative prognosis.

(ii) *Non-infiltrating carcinomatous ulcer*. Usually a large ulcer with a sharply defined dark-red, nodular wall is seen. It is found in 17.7% of gastric carcinomata and has an excellent operative prognosis.

(iii) *Infiltrating carcinomatous ulcer*. The wall of the ulcer is not sharply defined, blending with the surroundings. Portion of the edge is usually nodular and everted. This type occurs in 16.2% of cases. Its operative mortality is poor.

(iv) *Diffuse infiltrating carcinoma—the scirrhus type*. Diffuse carcinomatous infiltration of the stomach may transform the organ into a rigid tube—the so-called 'leather-bottle' stomach. Such extensive infiltration is not common. In such cases gastroscopy cannot be done as the stomach will not retain any air. More frequently areas of diffuse infiltration are well seen, the mucosa often being ulcerated. In these cases, the rigid appearance of the mucosa is evident, gastroscoically.

This type of malignant disease is found in 63.2% of cases and carries with it a very bad prognosis.

Determination of the macroscopic type of carcinoma should be made pre-operatively. In types 1 and 2 the surgeon should go ahead even with difficult and extensive resections but in types 3 and 4 unless the circumstances are unusually favourable, only palliative measures should be adopted. It is only in types 1 and 2 that five year survival rates have been recorded.

Diagnosis of Peptic Ulcer. In the diagnosis of peptic ulceration, X-rays are by far the most important procedure. Differentiation between benign and malignant ulcers has been discussed. It should be noted that duodenal ulcers cannot be seen gastroscoically, but it is usual to find an antral gastritis with or without erosions. However, gastroscopy may provide valuable information to the surgeon, as to the state of the gastric mucosa, when a gastric resection is contemplated. If extensive inflammation of the mucosa is found pre-operatively, thorough medical treatment should precede the operation. Should a resection be performed whilst the mucosa is extensively inflamed, a severe gastritis is likely to follow post-operatively.

Gastroscopy has been used in cases of gastro-duodenal haemorrhage, when the cause of the bleeding is either in doubt or unknown. It is a most unhappy experience for the surgeon to perform laparotomy in a case of haematemesis and be unable to find any lesion or to find a number of pin-point haemorrhages scattered through-

out the mucosa—the so-called 'gastrastaxis'. A personal case may be quoted. A male patient admitted to the Johannesburg General Hospital had coffee-ground vomitus and occult blood in the stools. X-ray examination failed to discover any lesion. Gastroscoic investigation demonstrated a small superficial ulcer of the lesser curve in the media of the stomach. The ulcer had only involved the mucosa and could not be demonstrated radiologically.

Cases have been recorded where a patient is known to have suffered from a duodenal ulcer. A severe gastro-duodenal haemorrhage occurred and it was deemed advisable to operate. Subtotal gastrectomy was performed but the haemorrhage remained uncontrolled as it was coming from a small lesser curve ulcer which had been missed—this may have been avoided by prior gastroscopy.

Gastroscopy may be used as a method of investigation in gross haemorrhage, as soon as the patient can be moved on to his left side.

The Post-Operative Stomach. The surgeon wishing to study the post-operative stomach and the results of his operations can only do so by gastroscopy. Examination of the post-operative stomach is difficult, requiring perfect technique and thorough knowledge of orientation. The various complications which may follow gastric resection or gastro-enterostomy will not be discussed.

Benign Tumours of the Stomach. These include polyps, pseudo-polyps, adenomata, leiomyomata, and neuro-fibromata. These may be single or multiple. Pseudo-polyps are merely oedematous thickenings of the mucosal rugae and are easily differentiated from the true polyp, as the former flatten out when the stomach is inflated with air. Adenomata are attached to the mucosa by a broad base, are not uncommonly found and approximately 40% become malignant. Because of the latter tendency all adenomata should be resected. Neuro-fibromas and leiomyomas can be recognised gastroscoically because of their submucosal origin. The mucosa covering such tumours is usually unchanged.

Finally, gastroscopy may prove of value in the elucidation of certain symptoms or diseases which are not obviously gastric in origin. Some of the dermatoses, which are allergic, may bear some relation to chronic gastritis, as pointed out by Schindler. The view was expressed that allergens may pass more readily through the diseased than through the normal mucosa. Although definite proof of such relationship is lacking, the occurrence in the same patient of chronic urticaria or eczema and chronic gastritis as proved gastroscoically, should lead one to suspect the possibility.

DIAGNOSTIC FEATURES OF GASTRIC PATHOLOGY USING THE HERMAN TAYLOR GASTROSCOPE

Gastritis. Three types of gastritis are generally recognised:—

(a) *Superficial gastritis*—the acute variety of the pathologist.

(b) *Hypertrophic gastritis*—corresponding pathologically to the chronic variety.

(c) *Atrophic gastritis* or gastric atrophy.

(a) *The Superficial or Acute Gastritis* may be recognised

gastroscopically by reddening of the mucosa and oedema. Small superficial erosions may be seen. This type may be caused by alcohol, excessive use of tobacco, indiscretions in the diet and nervous tension may also play a part. X-ray examination in such cases usually proves entirely negative.

Repeat gastroscopic examinations during treatment usually show improvement which corresponds with clinical improvement.

(b) *Hypertrophic Gastritis*. Characteristically, under gastroscopic examination this type may be recognised by numerous warty elevations of the mucosa, often giving it a typical cobblestone appearance. The superficial and hypertrophic types may occur together and multiple superficial erosions may be seen.

(c) *Atrophic Gastritis*. This may be the end of an infectious process or the result of a deficiency disease. Patches of atrophic gastritis can often be seen in elderly people and are always seen in untreated advanced cases of pernicious anaemia.

Gastroscopically the picture is typical. The mucosa is very pale and thin. Numerous blood vessels can be seen shining through the mucous membrane. Rugae are small and may be absent.

The X-ray diagnosis of gastritis is unsatisfactory. A negative X-ray examination does not rule out the possibility of gastritis. A positive X-ray examination only indicates the possibility of gastritis but cannot demonstrate the type or the presence of superficial erosions.

In severe types of hypertrophic gastritis differential diagnosis from carcinoma may be extremely difficult. In such cases both X-ray and gastroscopy should be used in an attempt to arrive at the correct diagnosis. In some cases the only way to settle the matter is by laparotomy and probably subtotal gastrectomy. It is far better to do a gastric resection for hypertrophic gastritis than to allow a gastric carcinoma to grow to inoperability.

Benign Gastric Ulcer. The ulcer is seen to have a sharply defined, punched-out edge. The surrounding mucosa usually shows a superficial gastritis. Well-marked radiating folds may often be seen converging on the ulcer, specially on the posterior wall.

Benign Gastric Tumours. The gastroscopic features of these have already been noted.

Carcinoma of the Stomach. It must be emphasised that although in many cases the gastroscope can be of use in the diagnosis of carcinoma of the stomach, its position is very secondary to radiology.

The gastroscopic appearance of carcinoma may be varied.

The Solitary Polypoid Growth is seen as a lobulated tumour projecting above the general level of the mucosa. Its surface is irregular, nodular and haemorrhagic and unless very small, the surface is certain to be ulcerated. The floor of the ulcer will contain a greenish or greyish slough.

The Carcinomatous Ulcer can be recognised by its raised everted edge and its slough-containing base. The folds involved by the growth are rigid and cannot be obliterated by air inflation. The pool of mucus is either cloudy or if there has been bleeding will contain coffee grounds. *The Scirrhus Type of Growth* has no sharp histological boundary. On gastroscopy, the lumen of the stomach involved by a scirrhus growth, is a narrow rigid cavity whose shape is unaffected by air inflation. The mucosa is irregular with lumps and ridges in complete confusion. The colour is greyish-white. As previously stated, the rigidity and deformity of the stomach may preclude a gastroscopic examination.

Conclusions. The importance of gastroscopy in clinical diagnosis has only been recognised recently. The invention of the flexible gastroscope by Schindler and its improvement by Herman Taylor, have made this type of investigation safe for the patient and easy for the gastroscopist. Any medical man who has once made a valuable diagnosis by gastroscopy will continue to use it.

An exact anatomical diagnosis can be made with the direct inspection which the gastroscope allows and diagnosis of gastric pathology has become established on a morphological basis.

Under the strains and stresses of modern life, dyspepsia has become so prevalent a symptom that it probably is no exaggeration to say that the use of the gastroscope will be used in clinical diagnosis more frequently in the future than the cystoscope, invaluable for so long, is used today.

MEDICAL AND HEALTH PROBLEMS OF AFRICA AND THEIR STUDY

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For a variety of reasons—humanitarian, scientific, economic, and social—interest in Africa is growing throughout the world. This concern is expressing itself in various ways. There are constitutional changes, industrial and agricultural developments, social evolutions, and scientific investigations which are perhaps not as familiar as they should be to South Africans.

A summary of recent medical and health research organisation as it concerns Africa south of the Sahara is therefore attempted here.

This great continental region, though situated mostly in the tropical and sub-tropical zones, shows a great variety of climatic and physical conditions. It has deserts, jungle, savannah, swamps, mountains and high

plateaux. It has areas of equatorial rain forest but larger semi-arid areas of intense sunshine. The social environment is provided by a population of about 100 million inhabitants composed overwhelmingly of indigenous Negro and Bantu living in tribal fashion. There are Asian and European immigrant stocks concentrated at present in East and Southern Africa which are contributing to the mixture of human cultures now so profoundly affecting the whole continent. This is the physical and social background to African health and medical problems.

I. THE MEDICAL PROBLEMS OF CLIMATE

Much of the early fear of African climate is disappearing as tropical medicine and hygiene reduce the hazards of preventable disease, and demonstrate more precisely the effects of sunshine, heat and humidity. In this field the knowledge of the extraordinary range of human adaptability or acclimatisation is perhaps one of the most significant results of the experiences of the recent war.

In Africa, important though climatic problems continue to be, there is considerable difficulty in disentangling such physical factors from those associated with communicable and local disease, nutrition and the general and social environments. It is impossible as yet therefore to say whether Bantu physical variations, and changes in European immigrants are due to heat, sunshine, food, social surroundings or other factors singly or in combination. There are other important questions such as:

1. Can human stocks of great intellectual and social capacity maintain their qualities in an African environment?

2. Can indigent races freed from debilitating disease, malnutrition and the shackles of a primitive social culture achieve great things in an African environment?

3. What are the results, immediate and remote, of high temperature, solar radiation and other physical influences of a tropical climate on human efficiency and well-being?

Also what is the value, in this respect, of the remarkable power of human adaptability?

4. Can sufficient relief be provided by such artificial means as air-conditioning to allow of optimum human activity in hot and tropical regions?

These urgently require answers if political and other planning is to avoid being illogical, unscientific and hazardous.

II. COMMUNICABLE DISEASES

Unfortunately Africa has provided excellent conditions for most of the devastating human pestilences. Its warmth, vegetation, and primitive races have been ideal factors for the existence of yellow fever, sleeping sickness, malaria, plague, bilharziasis, ancylostomiasis, excremental disease, trachoma and serious communicable skin conditions. Happily, many of the scientific problems concerning tropical disease prevalence have been solved, so that the continued existence of these pestilences is rather due to serious administrative obstacles or to general backwardness of the afflicted communities than to lack of knowledge.

Other problems require further research. Yellow

fever need not now be a world menace as the means for control of its urban mosquito vectors and an effective vaccine are safeguards against uncontrolled spread. Yet its rural epidemiology is not completely known. Trypanosomiasis is a complex of animal, insect and human relationship with some baffling problems for scientist and administrator. Tuberculosis, though its major technical problems are clear, is so dependent upon social and economic conditions that it is likely to become one of tropical Africa's most serious infective diseases. The respiratory diseases in Africa, as elsewhere, remain challenges to the research worker and the health administrator. The vague and unpredictable group of the influenzas and the polio-encephalitic conditions, and indeed most other virus diseases, still cannot be controlled.

It is thus seen that a large number of communicable diseases due to helminths, protozoa, fungi, bacteria, rickettsiae and viruses still exist to obstruct human progress in Africa.

III. MENTAL AND PSYCHOLOGICAL PROBLEMS

Mental problems are probably the most urgent everywhere. It is in their solution that satisfactory methods of community living, both local and international, will be found. Indeed world peace is bound up with such problems in society as were recently discussed by the World Federation for Mental Health. There are fundamental questions in Africa too in this field. Have the African indigenous races the capacity to adapt themselves to the changes produced by the scientific and industrial civilization of Western Europe? Have these people the inherent intellectual and emotional powers to match the achievements of other continents?

As yet it is only in the field of aptitude testing that investigation of African peoples has begun, though some day it should be possible to study their higher mental functions. The need for a study of mental function and capacity of different races in the changing environment of Africa is urgent.

The contact and increasing clash of cultures in Africa are producing obvious economic and sociological problems. However the psychological repercussions are equally important. It is naive to consider that these affect only the less advanced populations. Indeed there are many who argue that, though more subtle, the psychological handicaps being imposed on the more enlightened races are serious. Vague and complicated though such problems are, they require early study if Africa is to be developed by the co-operation of different races and cultures.

Other problems are associated with the changes induced by life in tropical and isolated regions. There are those who claim that the elimination of preventable diseases and the creation of a suitable social community make an adequate life possible for Europeans in tropical regions. The respective parts played by heat, tropical and debilitating disease, depressing physical environment, limited family and social interests and a sense of alien isolation in the emotional and mental troubles of European communities in tropical and semi-tropical Africa require definition, if present speculation is to be replaced by exact knowledge.

IV. NUTRITIONAL PROBLEMS

The untouched pastoral and agricultural tribes in many naturally favoured regions have satisfactory diets. Other tribes, because of social customs or actual lack of food, show every degree of malnutrition. In regions with much tropical and preventable disease the assessment of the dietetic and nutritional state of the population is difficult.

Where industrial conditions are spreading another situation exists. The change from a pastoral way of life to an industrialised economy has in most cases been too drastic. Lack of means, ignorance, and social inadequacies have caused both under- and malnutrition. All forms of malnutrition, including pellagra, scurvy, malignant malnutrition and other varieties of vitamin and amino-acid deficiencies are to be seen.

Nutrition in Africa is a challenging field for investigators where economic, social, medical and agricultural interests merge. Research must be wisely planned and interpreted if unsatisfactory administrative policy and action are to be avoided. Careful, long-term work by teams of specialists is therefore essential for the proper understanding of these great African problems.

V. OTHER MEDICAL CONDITIONS

The broad groups discussed above are those of most direct public health and social importance. However, the general study of morbidity and mortality in all indigent African groups is also important. Fundamental to this study will be much preliminary work on the vital statistics, and on the normal anatomy and physiology of these races but especially of the Bantu and negroes.

As the infectious diseases are reduced amongst tropical populations so will other pathological conditions be thrown into relief. Tumours, degenerative disease of the circulatory, excretory and digestive systems, and conditions of the nervous system and special senses form a relatively unexplored field. Their relative incidence, pathological and clinical picture, epidemiology, and etiology justify investigation not merely in their own African interest, but in the possibilities they offer for understanding the problems of degenerative and other disease in general now so important everywhere. The co-existence of European established communities and of indigent Bantu races gives a valuable opportunity for comparative studies.

VI. THE DEVELOPMENT OF AFRICAN RESEARCH PROGRAMMES

More detailed enumeration of African medical and health programmes is considered unsuitable for the purposes of the present paper. Thus only the main fields for enquiry have been given above and the facts outlined will be generally known to those interested in African continental problems. It is thought more worth while, here, especially as knowledge is not easily collated, to describe the various present African research programmes, more particularly those begun since the recent war.

The growing interest in the scientific, economic, and social questions of the Continent has launched an ever-

increasing number of research organisations. Each of the African governments is participating, and more recently the obvious common basis to many of the enquiries and methods of solution has evoked schemes for co-operation. The World organisations, too, are to participate in this new African enthusiasm.

(a) *The Union of South Africa.* The South African Institute of Medical Research, Johannesburg, has been concerned in general African medical research since its inception. Being the most comprehensive, organised research institution, its help is being increasingly sought for research work throughout Africa. Members of its staff have provided much of the existing knowledge of pneumonia, silicosis and other important industrial diseases, mosquito vectors of malaria and yellow fever, the epidemiology of yellow fever, relapsing fever, typhoid, typhus and plague, and the bacteriology and parasitology of many African diseases. In the present co-ordinated work, frequently in association with other South African workers from the Universities and the Union Health Department, the Institute is assisting British teams in various parts of Southern and Central Africa. Its reputation, its valuable store of experience and its important reference centre for type cultures make the Institute an almost automatic partner in any large co-ordinated medical laboratory and field research programme in this region. This is of undoubted advantage to the Union.

The South African University Departments and Medical Schools are also being approached to assist much British medical work in Africa. Their experience in such fields as physiology, psychology, sociology and nutrition is being eagerly consulted, while members of their staffs are being invited to accept temporary duty in various research projects undertaken by the British Colonial Office. South African official services which are undertaking work of general African interest also include certain of the units subsidised by the important Council for Scientific and Industrial Research, the Union Health Department and the Division of Veterinary Services.

These are the chief South African agencies which can contribute towards any common international plan of co-ordinated research. However much other South African health and medical investigation, including that undertaken by the gold-mining industry, local authority medical services, museums, and private bodies and individuals, is going to enrich general African continental knowledge. Many of the problems of the future for the rest of Africa, so likely to be precipitated by the present stimulus to economic and social growth, already exist and are being studied in the Union. For example, fundamental data on Bantu physiology, psychology, nutrition, pathology, adaptation to heat, and the medico-sociological consequences of mixed racial industrialisation is being collected and stored by the South African Universities, the South African Institute of Medical Research, government departments and private individuals. It was appreciation of such facts and of her direct concern in all African development which led the Union to follow up the proposal originally expressed by the 1946 British Commonwealth Scientific Conference of convening an African Regional

Scientific Conference. This was held in Johannesburg in October, 1949. The Conference, besides outlining the existing condition of research in the various territories south of the Sahara, adopted a unanimous recommendation to governments to launch an African Regional Scientific Council for co-ordination of research of mutual interest. This will be indeed a significant event which should materially help the study of the general African medical and health problems mentioned in this paper.

(b) *Belgian Territories.* The pace of development in the Belgian Congo both generally and in medical science is frequently not appreciated by South Africans. The Belgians have developed, for example, a widespread system of medical clinics and have an important Institute of Tropical Medicine in Leopoldville. This governmental service is charged with routine and research duties which have included much investigation into malaria, filariasis, yellow fever and trypanosomiasis. There are also important laboratories at Elizabethville, Stanleyville and in other centres.

However, apart from this routine, local official service, the Belgian Home-land has for long interested itself in Congo research, especially through the Royal Belgian Colonial Institute. This interest is now being rapidly intensified through the Brussels School of Tropical Medicine and the Institute of Tropical Medicine in Antwerp. As well as extending existing work new research is to be undertaken into plague, nutrition and rickettsial conditions. There is much new work too being launched in pure science of which such subjects as anthropology, agronomy and meteorology have considerable concern for medical workers. However a most significant feature, proof of Belgian determination not to lag behind in scientific African development, is the establishment since the war of two important, semi-official organisations in the Congo. The first is concerned with agricultural and forestry research, much of which has a bearing on medical and health science. However it is the Institute of Scientific Research in Central Africa (IRSAC) which is of more direct interest. It has been endowed with large funds to undertake programmes of scientific research in a number of fields in the Congo. Parasitology, pathology, physiology and nutrition are included in these programmes. It has most valuable arrangements for working through both formal research centres and through such private agencies as missions. It has the vision, too, to enlist other than Belgians in its plans and operations. Undoubtedly IRSAC is one of the new potent instruments of Belgian and all scientific progress in Africa. The Belgian Congo research plans, especially in an area so vast, rich, varied and strategic in relation to the whole continent, are so bold and comprehensive as to ensure their importance to the whole world. This research goes hand in hand with large development schemes to improve the economic, industrial and social situation of the Congo territories.

(c) *French Territories.* French concern in the medical and social problems of the people in her care is not new. For instance the two Pasteur Institutes of Dakar and Brazzaville are world famous, especially for their work on sleeping sickness and yellow fever. The French

home-country has also maintained a continuous interest in the scientific and tropical medical problems of her colonial territories in Africa. Since the recent war this interest has been considerably increased to cover all scientific and social problems. Indeed in many respects France has been in the lead in insisting on the urgency of African studies.

French activities since the war have been crystallised in the formation of the Office for Overseas Scientific Research. This has introduced a system of training scientists for service in Africa and elsewhere and arrangements for providing satisfactory service conditions for overseas workers. However, more significantly, it has established a system of overseas research institutions with a high degree of co-ordination not only with each other and the home headquarters, but with the local official routine technical services in each territory.

In French West Africa the long-established Pasteur Institute at Dakar has been responsible for research into yellow fever, plague and typhus. It evolved, too, the combined yellow-fever and smallpox vaccine which has been applied to millions in both West and Equatorial Africa. The Overseas Research Office has also contributed much in this region both through the fundamentally important I.F.A.N. ("French Institute of Black Africa") and through special scientific missions and teams. I.F.A.N. is a huge scientific organisation which was launched just before the recent war. In connection with the present paper its activity in demography, meteorology, entomology, physiology and nutrition is important. Medical and health problems of a wide range are thus being actively studied in French West Africa.

In French Equatorial Africa a similar history is to be recorded. Early beginnings are being widely extended both through an assumption of research functions by the general official services and by the creation of special institutions. In Equatorial Africa disease problems have been accepted as amongst the most urgent in view of the devastation caused there in the past by tropical disease. It was here that the famous French district clinic method of mass treatment of sleeping sickness was evolved.

Through the Overseas Research Organisation a vigorous new research body was created for French Equatorial Africa in 1946. It is the Institute of Central African Studies (I.E.C.). Like I.F.A.N. in French West Africa it extends its functions over the whole scientific research field, but of especial medical interest are the investigations, based on the headquarter centre in Brazzaville, into malaria, sleeping sickness and yellow fever. In addition there is direct medical interest in the proposed work on population problems, and African social and psychological constitution and capacity.

This immense surge of interest in all African problems—economic, social, and scientific demonstrated so vigorously by the French since the War, like that of the Belgians, is likely to have many repercussions. It will compel the attention of all concerned in African progress.

(d) *Portuguese Territories.* The Portuguese, being

the original European discoverers, possess centuries of experience of African conditions. To-day their interest is as intense as ever in African scientific problems. In recent years development has been on somewhat similar lines to that of the Belgians and French. Research organisations are being expanded by the home government and overseas missions are proceeding to the colonial territories of Mozambique and Angola. These missions are investigating a wide range of scientific, social and industrial problems. In medicine present Portuguese effort is directed towards a better understanding of such tropical conditions as sleeping sickness and the hazards to health in the climate of its African territories, the Institute of Tropical Medicine in Lisbon directly concerning itself in such work. The surveys presently being conducted by the government in the Colonies in such matters as hydrology, fisheries, anthropology, forestry and human health are all of medical interest.

(e) *British Territories.* The pioneer British work in science in Africa is general knowledge. Medical and health research in East, West and Central territories undertaken both officially and voluntarily by the services, special missions, and individual workers has grown steadily through the years. This is not the place to attempt an outline of the research or of its most beneficent results. Rather should some space be given to indicate the recent plans adopted to expand programmes in all British African territories.

It is very difficult for an onlooker to get a simple picture of British research activity. Paradoxically this complexity is probably a very good thing. It indicates elasticity of organisation and administration, an essential requirement for the vigorous growth of interest. The activities of private individuals and organisations, universities, local government departments, the Colonial Office and other Home Government departments, foreign institutions both private and official all combine in an ever-changing diversity to bewilder the chronicler.

The list of projects directly sponsored by the British Colonial Research Council can be seen in the Report for Colonial Research, 1948-1949.¹ The funds for these investigations come from votes under the Colonial Development and Welfare Act going back to 1940. This Act, as is well known, is symbolic of the responsibility now accepted by the United Kingdom Government for the improvement of the peoples under its care throughout the world. This paper cannot describe all the measures now taking shape. In mentioning those of medical and health research interest it must be emphasized that these are but part of a large co-ordinated programme of general research and development of all kinds.

In the United Kingdom there are such co-ordinating bodies as the Colonial Research Council, the Colonial Social Science Research Council, the Colonial Medical Research Committee, the Colonial Insecticides Committee and the British Commonwealth Scientific Office concerned in African social and medical research programmes.

In West Africa, assistance is being given on a generous scale to a number of projects, either directly to individual government departments or private

institutions or through the relatively new local co-ordinating British Government body—the West African Council. These projects include the Virus Research Institute at Lagos taken over from the Rockefeller Foundation malaria research in Nigeria, and the resumption of work in the Medical Research Laboratory previously maintained in Freetown by the Liverpool School of Tropical Medicine. A West African Institute for Trypanosomiasis Research with Headquarters at Kaduna and a Heat Research Laboratory at Oshodi have been established.

In East Africa funds from this same source are going to such projects as the establishment of an East African Bureau of Research in Medicine and Hygiene, the East African Tsetse and Trypanosomiasis Research and Reclamation Organisation, malaria research, the Virus Research Institute at Entebbe taken over since the recent war from the Rockefeller Foundation, and malnutrition studies. Again the same local variety of government organisation occurs. In this case the superior co-ordinating body is known as the East African High Commission covering the British Territories of Uganda, Kenya, Tanganyika and Zanzibar.

In the territories covered by the Central African Council, i.e. Northern and Southern Rhodesia and Nyasaland the projects assisted by the Colonial Research Council include a tsetse survey in Nyasaland and psychological research in Northern Rhodesia.

There are other immense projects of the Fund in fields of demography, sociology, agriculture and fisheries, which will have great influence on health and medicine in these regions.

The scheme so briefly outlined above of the nature of research fostered by the Colonial Development and Welfare Acts is not displacing the older forms of government research undertaken by local medical services. These are being continued, though usually linked with the newer projects.

Another official organisation in the United Kingdom participating in African medical research is the Medical Research Council. It has an important nutritional project in Gambia, and another unit has undertaken research in filariasis and onchocerciasis in East and West Africa. In Southern Rhodesia the Government Medical Service is making important contributions in such research fields as schistosomiasis, leprosy and tuberculosis.

Though university research is strongest still in South Africa significant developments are occurring in British Colonial Territories. Makerere College at Kampala has now a well-established modern medical school contributing much to original research in African physiology, anatomy and disease. Newly founded universities are the University Colleges at Ibadan and in the Gold Coast, West Africa. That at Ibadan proposes to have a medical institute to undertake research work.

Space does not allow of detailed reference to the numerous other research projects of special missions, church missions, museums, and private institutions and individuals being prosecuted throughout these great territories.

Though perhaps not so proportionately subsidised

as some Belgian and French research the British efforts are tremendous. Their variety and vigour are going to have revolutionary results for all Africa.

VII. INTERNATIONAL CO-OPERATION

The story of recent medical and health research organisations given above would be incomplete without some reference to international co-operation. The success of Belgian, British, French and South African pooling of medical and health knowledge and resources during the recent war was probably suggestive of the value of peacetime co-ordination. This has been the objective of a number of international African Conferences in the last few years. Though many of these, both past and projected, are not medical, they are of much collateral interest, such as the Veterinary Conference at Dakar in 1946, the Soil Conference at Goma in 1948, the Rinderpest Conference in Nairobi in 1948, and the proposed Conference on Rural Economy to be held at Jos at the end of 1949. Directly concerning medicine have been the Trypanosomiasis Conference at Brazzaville in 1948, Nutrition Conferences at Paris and Djibouti in 1947 and 1949, and proposed medical conferences to be held in 1950. Britain and France have shared the sponsorship of these Conferences, while the important African Regional Scientific Conference in Johannesburg was arranged by South Africa as described above.

Besides their intrinsic value several of these Conferences have had important results in the establishment of African Regional Bureaux and Councils. Indeed there is a distinct risk of over-organisation with a multiplicity of conferences, committees and bureaux. Nevertheless the generous exchange of views and of plans is immensely stimulating to African research, and a safeguard against wasteful duplication of effort.

This picture of international co-operation in African research by Belgian, British, French, Portuguese and South African interests is completed by recognising its inclusion in the wider world plans. This is secured by the active participation of these countries in the technical and scientific research accepted as important functions by several of the specialized agencies of the United Nations. The World Health Organisation, the Food and Agriculture Organisation, and the U.N. Educational, Scientific and Cultural Organisation, are the bodies of special interest. The establishment of the proposed African Region of W.H.O. will facilitate the co-ordination of African medical and health research, as well as making available to Africa the great resources of this important world health body.

CONCLUSIONS

In this paper only one small but nevertheless important field being investigated in Africa, namely medical and health problems, has been outlined. A perspective will only be got if it is recalled that immense parallel activities are already launched or proposed by most African States in agriculture and industry and in economic, educational and social development. Undoubtedly Africa is destined for immense changes in the near future. An emergence from the ignorance,

disease and backwardness of the past is intended for Africa in terms of years against the centuries needed by Europe. It is the awareness of the risks associated with such a revolution that has prompted comprehensive and bold planning. It is recognised, however, that wise planning can only proceed from sound knowledge, hence the imaginative and ambitious research programmes sponsored by the various governments and other bodies. Equally important it has been accepted that in Africa more than in any other Continent the control of disease, the improvement of health, and the release of human mental and physical energies are the first essential steps to progress.

The impatience to proceed may be unfortunate in some respects. Planning and direction of research are not to be denied, but in research too much control and supervision can be ultimately harmful. Undoubtedly much *ad hoc* organised official investigation can provide simple and direct solutions to urgent field problems. There remains, nevertheless, an essential place for independent research. In all the great schemes taking shape in Africa contributions from bodies outside the direct control of official authority should be fostered. So many problems in the health and medical field are fundamental to knowledge and science. They touch so many deep human interests that their elucidation will call for freedom in planning, discussion, and in the interpretation and expression of results. These are the fields of choice for the activities of such independent detached bodies as the universities and non-official research institutions. A very special responsibility in the case of South Africa therefore is to see that our universities and such bodies as the South African Institute of Medical Research are kept vigorous. They have the task of providing many of the men, equipment, and other resources required in research in Africa. Such resources are all too limited. The research functions not only of the basic institutions but also of government agencies must therefore be accepted as important if South Africa is to be a worthy member of the team now uniting in a common aim. This aim is to help Africa and in so doing to help the world towards better conditions and peace.

REFERENCE

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OCULAR PARALYSIS WITH PTOSIS DUE TO A STING OR BITE

JOHAN F. WICHT, M.A., M.D. (DUBLIN)
Cape Town

The following is the record of a European child who was admitted to the City Hospital as a suspected case of poliomyelitis. She was taken into hospital as the result of a telephone conversation with a local practitioner who telephoned about 9 p.m. asking for advice. He reported that the child, a girl of eight years, had taken ill the same morning with drowsiness and vomit-

ing, which came on suddenly at about 11.30 a.m. He had been called to see her at about 4 p.m. and had found her stuporose with bilateral ptosis and fixed dilated pupils.

Because of the impossibility of making a diagnosis without further investigations, and also because it was feared that the paralysis might spread to the respiratory centre, it was decided to admit the child for observation. She arrived about an hour later, accompanied by her parents, who added an interesting bit of information to the history given by the practitioner. At 9.30 that morning, while playing in the road near her home on Prince George's Drive, Cape Flats, she complained of being stung on the ankle. She was unable to say what had stung her and was not at all distressed. She continued to play until 11.30 a.m. and events then followed the course described by the doctor.

Examination revealed a robust girl of eight years who had not only ptosis, but complete paralysis of all the muscles of both eyes. The pupils were fixed and dilated. There was no evidence of facial paralysis, nor were the limbs affected. She was drowsy but could be roused and she replied reluctantly to questions, in a somewhat nasal voice. From time to time she retched and hiccuped. As she had a cleft palate it was not easy to decide if the nasal voice was caused by palatal paralysis. On examining the throat with a spatula the soft palate did not appear to move freely.

The site of the sting was clearly visible on the ankle where there was a small circular raised area about the size of a sixpence, with a minute, almost invisible, spot in the centre. It was not unduly tender and there was no surrounding oedema or inflammation.

Although the father volunteered the information that he had seen a puffadder near the house, it was obvious that the lesion was not a snake bite. The possibility of scorpion sting was considered, but the absence of pain at the site seemed to be against this. Nevertheless 10 c.c. of scorpion anti-venom was given intramuscularly.

Button spider bite was also thought of but this seemed unlikely for two reasons: firstly, *Latrodectus indistinctus* has not been reported in the area from which the patient came, though the less poisonous *L. geometricus* is found all through the Peninsula. Secondly, the symptoms of button spider bite are those of an acute abdomen with severe cramps, and the site is usually extremely painful. The bite of the baviaan spider or some other species of tarantula was not forgotten, but here again there is usually, if not always, pain at the site. The possibility of tick paralysis was speedily dismissed, as the symptoms in this case did not at all conform to those described in the medical literature dealing with this condition.

Since the cause of the paralysis was unknown, it was impossible to predict the outcome, and preparations were made in case respiratory failure should supervene. The breathing machine was not called into use as the patient's condition, after remaining stationary for an hour or two, began gradually to improve.

When seen next morning she was less apathetic and was propping her eyelids with her fingers. On the following day she was able to open and move her eyes.

By this time the constitutional symptoms had passed off and she was discharged a few days later, apparently normal except that the pupils still did not react to light.

Incidentally, the result of examination of the cerebrospinal fluid, which was not available until the peak of the paralysis had been passed, was in all respects normal.

The paralysis was apparently due to a selective neurotoxin introduced by the bite or sting of some insect or arthropod whose identity could not be established. The condition in no way resembled an allergy such as might follow the sting of a bee.

My acknowledgments are due to Dr. Finlayson who kindly discussed the case with me at a late hour on the telephone and to whom I am especially indebted for his advice and information regarding button spider (*Latrodectus*) bites.

MECKEL'S DIVERTICULUM IN A STRANGULATED INGUINAL HERNIA (LITRE'S HERNIA).

M. STEIN, M.B., B.Ch., RAND, D.A., D.G.O.,
F.R.C.S. EDIN.

Durban

F. B. A., a male aged 41 years, was admitted to Addington Hospital on 31 May 1949 complaining of pain and swelling in the left groin. He had had bilateral inguinal herniae for 12 years and had worn a truss which had controlled them adequately till the day of admission.

Six hours before admission the truss slipped and a large painful swelling appeared in the left groin. He could not reduce it himself. The swelling rapidly became more and more painful and he vomited several times. He also noticed that he had not passed flatus since the swelling appeared.

A well-built adult male, he was obviously in severe pain. *Head and Neck:* N.A.D.; *Heart:* N.A.D.; blood pressure, 160/110 mm. Hg. *Lungs:* N.A.D.; *Abdomen:* This moved with respiration. There was generalized tenderness, with some guarding but no rigidity. Bowel sounds were accentuated.

Groins: *Left:* A large indirect inguinal hernia extended into the scrotum; extremely tender and borborygmi observed on palpation; *Right:* Easily reducible, large indirect inguinal hernia.

Diagnosis. Strangulated indirect left inguinal hernia.

Operation. (Lumbar anaesthesia). A left inguinal incision was made and the sac exposed and opened. About six inches of bluish bowel was found to be present with the constriction at the external ring. On releasing the constriction a Meckel's diverticulum was found attached to the antimesenteric portion of the bowel with its apex lying quite free. After the use of warm towels for some time the bowel gradually regained a more natural colour and peristalsis re-appeared.

The patient had an uneventful convalescence and was discharged on the ninth day.

Moses¹ reviews the subject of Meckel's diverticulum and quotes 1,605 cases by 43 authors. Of these, Litre's hernia was a complication in 11.7% of cases. This relatively large number is probably due to the fact that so many cases of this type are reported on account of their rarity; whereas in fact, the complications of haemorrhage, obstruction and perforation are more common.

Litre first described this hernia in 1742 (a Meckel's diverticulum in a hernial sac). However, Lind² credits Lavatar with a description of this Hernia in 1671.

In 1930 Sweet³ reviewed the literature from 1700 onwards and collected 14 cases associated with femoral hernia and added one of his own. Later he found six more, adding another himself, making a total of 22.

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In 1933 Gray⁴ found 169 cases reported: 52.6% inguinal; 21.8% umbilical; 19.5% femoral.

In 1943 Bird⁵ collected 182 cases: 52% inguinal; 20% umbilical; 20% femoral.

No mention was found of the relative incidence of Littre's hernia associated with the complication of strangulation. It would, however, appear that this must be a comparatively rare occurrence.

My thanks are due to the Medical Superintendent, Addington Hospital, for the use of the notes on this case.

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PASSING EVENTS

We deeply regret to record the sudden death of Dr. Charles Molteno Murray at his home in Kenilworth, Cape Province, on 13 January 1950. We extend our deepest sympathy to the bereaved family.

FEDERAL COUNCIL: NEXT MEETING

The next meeting of the Federal Council will be held at Medical House, 5 Esselen Street, Johannesburg, from 16 to 18 March 1950. Meetings of the Executive Committee and the Central Committee for Contract Practice will be held on Wednesday, 15 March. Members of Council are advised to make their hotel reservations early.

AN AMOEBIASIS UNIT

This Unit has recently been established in Durban under the Honorary Directorship of Dr. R. Elsdon-Dew, the Honorary Assistant Director being Dr. T. Armstrong. The staff is provided largely by the Natal Provincial Administration, and there is a local committee of experts in various fields advising the Unit on its activities.

The Unit will be undertaking surveys, including clinical work and a considerable amount of laboratory investigation.

Considerable co-operation has been given by the Union Health Department and the City of Durban Health Department and many others have been generous in their offers of help.

This is a most important research project for the Union and further results of this research will be awaited with great interest by medical practitioners and public health authorities alike.

NATIONAL ROAD SAFETY ORGANISATION

As the result of a report and recommendations made by the Executive Committee of the Federal Council of the Medical Association of South Africa and submitted to the Organization by the President, Dr. A. W. S. Sichel, the Enforcement Sub-committee of the National Road Safety Organization is meeting to consider a memorandum relating to *The Medical Examination of Applicants for Drivers' Licences*.

Dr. C. G. L. van Dyk, of Pretoria, who is Dr. Sichel's alternate as the Association's representative on the National Road Safety Organization, has been invited to be present at the discussion of the memorandum as a co-opted member of the Enforcement Sub-committee.

STERILITY AWARD

The American Society for the Study of Sterility is offering an annual award of \$1,000, known as the Ortho Award, for an

essay on the result of some clinical or laboratory research pertinent to the field of sterility. Competition is open to those who are in clinical practice as well as to individuals whose work is restricted to research in basic fields or full-time teaching positions. The prize essay will appear on the programme of the forthcoming meeting of the American Society for the Study of Sterility, which is to be held at the Sir Francis Drake Hotel in San Francisco on 24 and 25 June 1950.

Full particulars may be obtained from the Secretary, Dr. Walter W. Williams, 20 Magnolia Terrace, Springfield, Massachusetts. Essays must be in his hands by 1 April 1950.

EMPIRE MEDICAL ADVISORY BUREAU

The Director of this Bureau (B.M.A. House, Tavistock Square, London, W.C.1), has forwarded to the Editor's office a *Summary of Regulations for Postgraduate Diplomas and of Courses of Instruction in Postgraduate Medicine*. These regulations are available on loan to members who may be interested.

Members intending to proceed overseas for post-graduate study are advised to communicate with the Director at B.M.A. House, as he will be glad to give them information about accommodation and post-graduate facilities.

DOMUS MEDICA: DOMUS CHIRURGICA

Through the unremitting efforts of the International College of Surgeons, an international home is now available to surgeons from every quarter of the globe. The International College, which was founded and is being maintained for the express purpose of building fellowship and fraternity throughout the profession, will house a new section of the Domus Medica at the College headquarters, 1516 Lake Shore Drive, Chicago. This division will be known as the Domus Chirurgica and will be under the direction of Dr. Valentin Charry. It will offer to all surgeons a great variety of information, service and assistance in the fields of science, general culture and travelling problems.

From the scientific point of view, the surgeon will find here complete information with regard to reunions, conferences and other important professional meetings, as well as opportunities to inspect hospitals and research centres. Postgraduate courses are included in the plans, and there will be monthly conferences and meetings at the College for visiting students and doctors taking postgraduate courses. For members of the College, personal introductions and credentials will be supplied in the form of an official booklet that will serve as identification, recommendation and professional passport anywhere in the world. Arrangements are being made to supply microfilm presentations of articles from the surgical literature to any member on request. A Museum of Surgical History is contemplated, to be housed at the home of the International College and maintained on a very high level of interest and authenticity.

The general cultural advantages will include a mass of readily available information about museums, libraries, exhibitions of painting and sculpture, concerts, etc. Every effort will be made to insure the visiting surgeon a well rounded and rewarding programme of activities while he is in Chicago.

The travel Service will be designed on the broadest possible basis and will furnish information about all countries and what they offer in the way of special interest—historic shrines and landmarks, local customs, folklore and the like. Trips will be arranged in co-operation with regular travel agencies.

It is probable that the College will eventually establish home offices, similar to the one in Chicago, in most of the principal countries of the world, thus putting the facilities of this international organization at the disposal of surgeons everywhere. This would be an inestimable help toward future exchanges and would greatly facilitate travel from one country to another.

The establishment of the Domus Chirurgica marks an encouraging step forward in the pursuit of international understanding and surgical progress. To form world-wide friendships based on mutual knowledge and esteem, so that every surgeon may feel truly at home with his colleagues in any part of the world, is to create lasting bonds of faith and endeavour.

VERENIGINGSNUUS : ASSOCIATION NEWS

THE BENEVOLENT FUND

The following contributions to the Benevolent Fund during December 1949 are gratefully acknowledged:

Votive Cards: In memory of:

Dr. C. C. Elliott by Dr. A. W. S. Sichel, Dr. A. I. Goldberg,
Dr. H. A. Moffat, Dr. A. Murray, Mr. T. Lindsay Sandes,
Dr. C. H. Kruger, Chairman and Directors of Hof Street
Nursing Home.

Dr. D. A. Ogilvie by Dr. G. F. Wright.

Mrs. R. Lund Baikie by Dr. H. A. Kalley, Dr. C. E. L.
Burman, Dr. R. B. Peckham, Dr. C. A. Ovendale, Dr. B. A.
Armitage, Dr. J. F. Rivers-Moore, Dr. L. R. Tibbit.

Prof. T. B. McMurray by Mr. T. Lindsay Sandes.

Mr. W. K. Dose by Dr. C. H. Kruger.

Mr. Batty by Dr. C. H. Kruger.

Dr. Neil Macvicar by Dr. A. P. Moore-Anderson.

Dr. P. G. Harvey by Dr. A. W. S. Sichel, Dr. A. J. van der

Spuy, Dr. Maurice Franks, Dr. Esther Franks.

Mr. J. W. Beattie by Dr. C. E. L. Burman.

Total amount received from Votive Cards £22 0 6

Services rendered to:

Dr. J. W. Sunley Uys's wife by Dr. B.
Schulenberg.

Dr. A. J. van Wyk's son by Dr. W. Rabkin.

Dr. J. de C. Muller by Dr. D. J. McDonald,

Dr. A. J. Tinker, Dr. R. J. W. Charlton.

Mrs. K. Wortreich by Dr. A. W. S. Sichel.

John McCutcheon by Dr. A. Landau, Dr. E. G.

Greenfield, Dr. A. J. Patterson.

Mrs. S. Sax by Dr. S. Joel Cohen.

Dr. Raymund Theron's daughter by Dr. D. J.
van den Heever.

Mrs. J. M. Sachar by Dr. A. I. Goldberg.

Dr. Alexander Smith's wife by Dr. A.

Goldsmith, Dr. A. Ritten, Dr. R. L. Gird-

wood, Dr. R. J. W. Charlton, Dr. W.

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BOOK REVIEW

THE TRIAL OF JAMES CAMB

The Trial of James Camb (The Port-hole Murder). Edited by Geoffrey Clark, Barrister-at-Law: *Notable British Trials. Volume 71.* (Pp. 255, 15s.) London: William Hodge and Company, Ltd. 1949.

The establishment of the *Notable British Trials Series* marked the performance of a service of great significance for medical practitioners throughout the world. The striking feature of the books of this series is that they consist of the *verbatim* record of each trial, prefaced by an illuminating introduction by the editor of the particular monograph. In the *verbatim* record, question and answer are given and the instructive cross-examination and the re-examination are set out in full. It is this procedure which makes the book so valuable to medical practitioners, especially in South Africa, because this country is probably unique in respect of the great number of doctors who, as part-time or full-time district surgeons, especially in

the very extensive rural areas, are called upon to assist the courts daily in problems of forensic practice.

Every doctor who has ever had to give evidence in the witness box will remember the trepidation with which he embarks upon this duty. It is no light task to place oneself in the difficult position which requires an accurate and lucid explanation, often of very technical matters, in lay language.

The personal experience which the medical practitioner must endure in the witness box is the best way of learning how to give evidence.

Few, if any, of our colleagues ever reach the stage where they can enjoy giving expert evidence, especially in trials where the capital sentence is involved.

Equal in value to personal experience is the perusal of the actual record of a trial, because the medical reader is able to place himself in the position of the medical expert in the witness box and can try to anticipate his own replies as he studies the unfolding of the invariably fascinating story of the alleged crime.

All these points are brought to light very admirably in the present volume, which has not only an intrinsic interest for the general reader (which can only add to the enjoyment of the professional reader), but also includes a very considerable amount of medical testimony with which the medical reader may or may not agree.

The Trial of James Camb affords excellent illustrations also of the pitfalls which beset the path of the medical expert and of the profound problems involved in considering the differential diagnosis of a condition such as epilepsy in relation to hysteria.

In this particular case the value of the record is virtually enhanced by the fact that the medical experts were not in entire agreement. This results in a stimulating problem in which the reader can take sides.

Some of us will undoubtedly be amazed at the ease with which Dr. Hocking was able to recognize 'flat cells which lined the mouth' (p. 170), as coming indubitably from the buccal mucosa, particularly as these were alleged to have been found on a bed sheet and because, histologically, similar cells occur on the skin generally as well as on the vulva. It is surprising that Dr. Hocking was not cross-examined very severely about this statement, particularly as this finding led him to analyse further the blood stain in which he had found the 'flat cells', with the result that he demonstrated in the stain the constituents of the saliva. If he depended upon the demonstration of a salivary amylase in the stain, it is surprising that he was not asked whether urinary diastase would not have given the same reactions. Moreover, if the 'flat cells' were found in the blood stain, their origin may equally well have been from the vagina. There must be few, if any, histologists who would undertake to differentiate (many weeks after they had been shed) desquamated buccal cells from desquamated superficial vaginal cells.

Very interesting also was the opinion offered by Professor Webster that the deceased was dead before she was pushed through the port-hole into the sea. This opinion was apparently based on the evidence of a urine stain on a bed sheet. It was concluded by Professor Webster that the extravasation of the urine by the deceased was a terminal act, following which the deceased died. It seems, however, equally likely that loss of sphincter control resulting in extrusion of bladder contents could equally easily have taken place, not as a terminal act immediately before death, but as an event occurring during a fit leading to unconsciousness, and not necessarily to a fatal outcome.

These instances make clear the fascinating problems which arise for consideration by the medical reader, who would also undoubtedly be surprised by Professor Webster's unchallenged opinion that a chronic septic focus such as a chronic running ear could produce pathological changes in the bundle of His with resulting sudden death during exertion. Many pathologists would, undoubtedly, challenge such a conclusion about the cause of death in such circumstances.

The monograph under review undoubtedly contains many problems suitable for medico-legal debate and this is a function which the *Notable British Trial Series* may well come to serve in all parts of the world.

The publishers are to be congratulated on having undertaken the production of the series and they have put in their debt not only the general reader, but also the medical reader, wherever he may be practising.

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